Hazardous Substance Fact Sheet

1,2,3-Trichloropropane (1,2,3-TCP) *DRAFT*

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What is 1,2,3-Trichloropropane?

- 1,2,3-trichloropropane (1,2,3-TCP) is a man-made chemical and hence does not occur naturally in the environment.
- In the past, 1,2,3-TCP has been primarily used as a solvent and extracting agent.
- In industry, 1,2,3-TCP has been used as a paint and varnish remover, a cleaning and degreasing agent, a cleaning and maintenance solvent and, more recently, a chemical intermediate in the manufacture of other chemicals. It has also been used in the past in pesticide formulations.
- 1,2,3-TCP is also known as allyl trichloride, glycerol trichlorohydrin and trichlorohydrin.

What are 1,2,3-TCP's physical properties?

- 1,2,3-TCP is a colorless, heavy liquid with a strong acrid odor similar to chloroform.
- It evaporates almost as fast as water at normal temperatures.
- It dissolves oils, waxes, fats and numerous resins. It is slightly soluble in water.
- On exposure to sunlight, 1,2,3-TCP in the air breaks down while in surface water it is removed by volatilization. However it has a low soil sorption coefficient and may leach from soil into groundwater.
- It is also heavier than water causing it to sink into the deeper parts of an aquifer where it may persist for a long period of time leading to health concerns.

What are the possible adverse health effects of 1,2,3-TCP?

- Exposure to high levels (100 parts per million) of 1,2,3-TCP in may cause eye and throat irritation. Other effects that have been noted are central nervous system damage; liver damage and skin irritation
- 1,2,3-TCP is listed as a substance reasonably anticipated to be a human carcinogen based on evidence of tumor formation in multiple species of experimental animals.
- Laboratory animals exposed to high levels of 1,2,3-TCP developed damage to the kidney, the liver and the respiratory system
- Scientists are uncertain if low level, long-term exposure to 1,2,3-TCP can cause adverse health effects such as cancer, nervous system effects, organ damage, or reproductive effects in humans. Scientists deal with this uncertainty by setting safe levels of 1,2,3-TCP in soil, water and air.
- Safe levels of chemical substances are usually set at concentrations many times lower than those shown to cause no adverse health effects in laboratory animals. For 1,2,3-TCP, the Environmental Protection Agency has set a level of 0.056 micrograms per liter as a health-based preliminary remediation goal.

What are the health risks if my drinking water has 1,2,3-TCP levels above government standards?

- Your personal health risk will depend on how much 1,2,3-TCP is in the water, how much water you consume, how frequently you use the water, and for how long you have used the water. Admittedly, this is often an unsatisfactory answer, but there is much uncertainty about the long-term health consequences of consuming 1,2,3-TCP contaminated water, particularly when the duration of exposures is unknown.

How can 1,2,3-TCP contamination in groundwater be cleaned up?

- **Pump and Treat** is a method that uses wells to pull contaminated groundwater from the water-bearing zone or aquifer, treat it above ground,

and then discharge it to a sewage treatment plant or other approved location. Treatment processes may include bioremediation, chemical oxidation, and other types of physical transformation.

- **In-situ treatment**, on the other hand, treats contaminants within the aquifer or water-bearing zone. Treatment processes are similar to those used in pump and treat systems. Chemicals or nutrients for microorganisms are typically injected into wells for dispersion throughout the aquifer.
- **Bioremediation** uses microorganisms such as bacteria, fungi, and yeasts to transform contaminants into harmless chemicals. Microorganisms use the chemicals as a food and energy source for their growth. To date, 1,2,3-TCP has not proven to be amenable to bioremediation. The Strategic Environmental Research and Development Program (SERDP) recently issued a request for proposals regarding research into the remediation of this and other emerging contaminants that SERDP believes could benefit from more extensive study. (See SERDP's statement of need at http://www.serdp.org/funding/FY2005/sons.html for more details.)
- **Chemical oxidation** involves the transformation of contaminants by addition of chemicals such as ozone and hydrogen peroxide. The resulting chemical reactions break 1,2,3-TCP down into carbon dioxide, water, and chloride ion.
- 1,2,3-TCP may also be amenable to other forms of chemical transformation such as **reductive dechlorination** in which chemically reducing conditions are created to enhance the removal of chlorine atoms from the 1,2,3-TCP molecule.
- The cleanup method most appropriate for use at a particular site will depend upon conditions at the site such as 1,2,3-TCP concentration, the depth to contaminated groundwater, the types of microorganisms present in the aquifer, and other site-specific factors.

How can 1,2,3-TCP contamination in soil be cleaned up?

- The particular method used to clean up 1,2,3-TCP contamination in soil will depend upon conditions such as 1,2,3-TCP concentration, access to contaminated soil, cost of soil disposal, and other site-specific factors.
- Because of its relatively low volatility 1,2,3-TCP most likely will not be as easily removed by soil vapor extraction as other common chlorinated solvents such as trichlorethylene and tetrachloroethylene.

References

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